

THERMALLY AND ELECTRICALLY ENHANCED BALL GRID ARRAY PACKAGING

ABSTRACT OF THE DISCLOSURE

Electrically and thermally enhanced die-up ball grid array (BGA) packages are described. A BGA package includes a stiffener, substrate, a silicon die, and solder balls. The die is mounted to the top of the stiffener. The stiffener is mounted to the top of the substrate. A plurality of solder balls are attached to the bottom surface of the substrate. A top surface of the stiffener may be patterned. A second stiffener may be attached to the first stiffener. The substrate may include one, two, four, or other number of metal layers. Conductive vias through a dielectric layer of the substrate may couple the stiffener to solder balls. An opening may be formed through the substrate, exposing a portion of the stiffener. The stiffener may have a down-set portion. A heat slug may be attached to the exposed portion of the stiffener. A locking mechanism may be used to enhance attachment of the heat slug to the stiffener. The heat slug may be directly attached to the die through an opening in the stiffener.

A292-01.wpd